What is claimed is:

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- A composition comprising:
 at least one transition metal compound;
 aluminum; and
 a solution comprising at least one base or at least
 one electrolyte.
- 2. The composition of claim 1, wherein the transition metal compound is a compound of iron, ruthenium, osmium, cobalt, rhodium, iridium, nickel, palladium, platinum or combinations thereof.
- 3. The composition of claim 1, wherein the base is 15 LiOH, NaOH, KOH, RbOH, CsOH, Mg(OH)₂, Ca(OH)₂, Sr(OH)₂, Ba(OH)₂, Na₂CO₃, K₂CO₃, CaO, or NH₃, or combinations thereof.
- 4. The composition of claim 1, wherein the base or the electrolyte is present in solution at a concentration from about 0.1
 20 molar to about 5 molar.
 - 5. The composition of claim 1, wherein the at least one transition metal compound is in solution.
- 25 6. The composition of claim 1, wherein the at least one transition metal compound is admixed with the aluminum.

7. A composition comprising:

at least one transition metal compound;

an alloy comprising aluminum and at least one high electron mobility component; and

a solution comprising at least one base or at least one electrolyte in contact with the alloy.

- 8. The composition of claim 8, wherein the transition metal compound is a compound of iron, ruthenium, osmium, cobalt, rhodium, iridium, nickel, palladium, platinum or combinations thereof.
- 9. The composition of claim 8, wherein the base is LiOH, NaOH, KOH, RbOH, CsOH, Mg(OH)₂, Ca(OH)₂, Sr(OH)₂, 15 Ba(OH)₂, Na₂CO₃, K₂CO₃, CaO, or NH₃, or combinations thereof.
 - 10. The composition of claim 8, wherein the at least one transition metal compound is in solution.
- 20 11. The composition of claim 8, wherein the at least one transition metal compound is admixed with the alloy.

- 12. The composition of claim 8, wherein the high electron mobility component is C, Si, Ge, Sn, AgBr, CdTe, HgSe, HgTe, AlAs, GaAs, GaSb, InP, InAs, InSb, SiC, ZnSiP₂, CdSiP₂, CdSnAs₂, CdIn₂Te₄, Hg₅In₂Te₈, PbSe, PbTe, Bi₂Te₃, or Te, or combinations thereof.
- 13. The composition of claim 8, wherein the at least one high electron mobility component is provided in an amount from about 1% to about 95% of the alloy by weight.

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14. A method of producing hydrogen gas comprising the steps of:

providing the composition of claim 1, wherein the at least one base is in aqueous solution; and

15 contacting the aluminum with the aqueous solution.

15. A method of producing hydrogen gas comprising the steps of:

providing the composition of claim 1, wherein the at least one base and the at least one transition metal compound are in aqueous solution; and

contacting the aluminum with the aqueous solution.

16. A method of producing hydrogen gas comprising the steps of:

providing the composition of claim 8, wherein the at least one base is in aqueous solution; and

contacting the alloy with the aqueous solution.

17. A method of producing hydrogen gas comprising the steps of:

providing the composition of claim 8, wherein the at least one base and the at least one transition metal compound are in aqueous solution; and

contacting the alloy with the aqueous solution.

18. A method of manufacturing the alloy of claim 8, comprising the steps of:

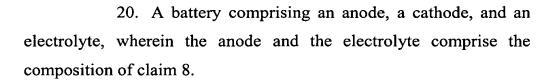
providing the aluminum and the at least one high electron mobility component as ingredients;

melting the ingredients to form a mixture; and cooling the mixture until the mixture solidifies.

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19. A battery comprising an anode, a cathode, and an electrolyte, wherein the anode and the electrolyte comprise the composition of claim 1.



- 5 21. A capacitor comprising an anode in contact with a sample of carbon foam, a cathode, an electrolyte, and a dielectric, wherein the anode and the electrolyte comprise the composition of claim 1.
- 22. A capacitor comprising an anode in contact with a sample of carbon foam, a cathode, an electrolyte, and a dielectric, wherein the anode and the electrolyte comprise the composition of claim 8.
- 23. A fuel cell comprising an anode, a cathode, and an electrolyte, wherein the anode and the electrolyte comprise the composition of claim 1.
- 24. A fuel cell comprising an anode, a cathode, and an20 electrolyte, wherein the anode and the electrolyte comprise the composition of claim 8.
- 25. A fuel cell assembly comprising a hydrogen fuel
 cell and a hydrogen generator, wherein the hydrogen generator
 comprises the composition of claim 1 and water.

26. A fuel cell assembly comprising a hydrogen fuel cell and a hydrogen generator, wherein the hydrogen generator comprises the composition of claim 8 and water.